

LETTERS

Quantifying physical activity in COPD: different measures for different purposes

We have read with great interest the recent article by Walker *et al*¹ and the accompanying editorial by Morgan² on the measurement of physical activity in chronic obstructive pulmonary disease (COPD). Walker *et al* compared an activity monitor (DynaPort) with a leg-mounted uniaxial accelerometer (Actiwatch). They concluded that “lower limb activity is the major determinant of whole body activity”. In the accompanying editorial Morgan states that it therefore “does not seem necessary to use overly complicated devices” any more to measure physical activity. The latter statement is, in our opinion, an oversimplification.

First, the validity of the Actiwatch to assess leg activity in these patients seems insufficient. Walker *et al* reported an inverse and poor relation ($r = -0.42$) between “leg activity” from the Actiwatch and walking time from the DynaPort. Since the DynaPort showed excellent agreement with video recordings,³ this inverse relation suggests that the Actiwatch does not accurately measure patients’ walking at low walking speed.

Second, movement intensity and overall movement time (including minor movements such as fidgeting) were chosen as the main outcomes from the DynaPort to represent “whole body activity”. These outcomes do not reflect the full scope of information that activity monitors can provide. Activity monitors differentiate between postures (ie, standing, sitting and lying) and movements (ie, walking and cycling) and classify intensities of movements. By being able to measure these outcomes, activity monitors provide information that is easily interpretable both for healthcare providers and patients. In contrast, uniaxial accelerometers register “activity counts” as an abstract overall measure of daily activity that combines intensity and time spent in physical activity.⁴

In general, both accelerometers and activity monitors can provide useful information depending on their purpose of use. Validated accelerometers are useful as an overall measure of physical activity, discriminating physically active from physically inactive populations. Most accelerometers and pedometers seem, however, not to be sensitive enough to pick up changes in physical activity in slowly moving patients.^{5,6} Whenever one wishes to quantify daily time spent in different leg activities (ie, walking or cycling) and postures one will have to rely on activity monitors. Facilitating interpretability of results in this way is of special interest when one aims at increasing patients’ awareness of their activity levels.

In summary, the study by Walker *et al* does not provide enough evidence to allow the conclusion that the Actiwatch accurately measures “leg activity” in patients with COPD. This uniaxial leg accelerometer should therefore not be regarded as a surrogate measure for an activity monitor in this population. Efforts should be undertaken to make activity monitors as user-friendly as possible. These should lead to the next generation of physical activity monitors with larger memory and smaller size that are affordable for use in both research and clinical practice.

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Authors’ reply

We would like to thank Dr Langer and colleagues for the interest shown in our paper.¹ The authors appear to have interpreted our article and the accompanying editorial as suggesting that accelerometers measure exactly the same outcomes as activity monitors. This is not the case, as evidenced by the fact that we used an activity monitor (DynaPort) to validate the recordings made with an accelerometer (Actiwatch). However, the data we presented show a close correlation between measurements of overall activity recorded by the two devices (overall activity score: $r = 0.92$, intensity of activity score: $r = 0.83$). This

supports our assertion that leg activity measured by the Actiwatch is the major determinant of whole body activity measured by the DynaPort.

Accelerometers do not try or claim to specifically measure time spent walking, which is not the sole contributor to overall whole body activity. In our COPD population, time spent cycling is rarely of relevance and no patient spent any time cycling during our DynaPort recordings. We do not dispute that time spent walking is a useful measure and an easy concept for an individual to understand, but we disagree that level of physical activity is conceptually difficult for a patient to comprehend. In fact, the UK government has tried specifically to address the issue producing guidance on how to increase physical activity in the overall population.² We believe that improving level of physical activity after an intervention is an outcome with which patients can identify. Despite the concerns raised, the Actiwatch was able to detect change in activity in slow moving patients after a standard exercise programme, even with a similar level of disease severity and improvement in walking distance compared with previously published results.³

Clearly the information obtained from precisely measuring time spent walking and cycling has to be balanced against the lower cost and ease of use of accelerometers. In effect, purchase of current activity monitors is impossible for almost all rehabilitation programmes so, although this outcome is an important one, it will not be measured. In other studies we have found that a significant number of patients considered the activity monitor cumbersome and difficult to use and, as a consequence, failed to complete adequate recording time.⁴ We agree that, in time, activity monitors will advance technologically and current problems will be overcome but, at present, they are likely to remain a research tool because of the additional information they supply. For these reasons we feel that accelerometers are a more appropriate device for clinical practice because they accurately measure activity, are affordable and easier to use.

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